

DISCUSSION

Total Gaseous Mercury: Data reported as TGM are believed to be representative of vapor-phase elemental mercury, Hg^0 . Although reactive gaseous species of mercury such as HgCl_2 exist in air, they are typically present at less than 5% of Hg^0 levels and are unlikely to reach the gold traps in the mercury analyzers due to the high degree of water solubility for these species (Lindberg; Stevens, personal communication). Data from ambient air monitoring efforts at Pettigrew State Park are not presented here but were remarkable only for exhibiting uninterrupted northern hemisphere “background” conditions for TGM (EPA, 1997a). During the summer of 1996, the average 15-minute reading for TGM at this location was 1.54 ng/m^3 (max = 6.01 ng/m^3 , SD = 0.24, n=4664). In contrast, early sampling results from Lake Waccamaw State Park highlighted frequent fluctuations in TGM exceeding an order of magnitude above background conditions (see figure 1). Initially, these results were considered puzzling given the relative remoteness of both sites and reported data on atmospheric TGM at remote or rural locations (EPA, 1997a).

Both Pettigrew and Waccamaw State Parks are situated in very similar areas characterized by flat marshy or sandy terrain with sparse development and little industrial activity within 20 to 25 kilometers. However, while the closest reported point source of mercury emissions to Pettigrew is a large pulp and paper mill approximately 30 kilometers away in Plymouth, NC (1996 reported emissions, 131 lbs.), the Waccamaw site could be affected by several large regional mercury emission sources. These include two coal-fired utility boilers, a municipal waste incinerator and a mercury cell chlor-alkali facility (see table 5). In order to determine whether a directional component existed for elevated TGM values a meteorological station was erected at Waccamaw State Park with a wind sensor placed at 20 meters above ground level. Overlapping wind direction and TGM concentration data are available for limited periods during 1998, including several weeks that included significantly elevated TGM readings (see figures 1 and 4). The majority of elevated readings during these periods appear associated with winds originating from the east-northeast.

Two monitoring stations were erected in the area surrounding Riegelwood, NC in early 1999 to provide additional regional sampling locations. These sites were situated approximately 1 kilometer southeast and south-southwest of the chlor-alkali operation and a large pulp-and-paper mill. TGM results from the Riegelwood sites show patterns similar to those seen at Waccamaw State Park (figures 2 and 3). Mercury concentration roses suggest a relationship between wind direction and elevated TGM readings (figures 5 and 6) consistent with a source of mercury

